

The pleistocene Foraminifera of Slesvick and Holstein.

By
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Not long ago the rich geological literature of the pleistocene deposits of Slesvick and Holstein received a valuable addition in the interesting paper of Dr. C. GOTTSCHÉ: Die Endmoränen und das marine Diluvium Schleswig-Holstein's¹). In examining specimens of the marine deposits, Dr. GOTTSCHÉ found that they frequently contained foraminifera. He then enquired if I would be willing to undertake the determination of the foraminifera in his specimens, which offer I gladly accepted, having already examined a large number of foraminifera from Holstein. The result of my determinations is published in this paper, which should be considered as a supplement to the above-mentioned paper by Dr. C. GOTTSCHÉ, the latter being presumably already known to the reader.

The foraminifera of the following localities mentioned by Dr. GOTTSCHÉ have been examined by me either previously or now for the first time.

7.²) Nindorf, CLAUS BEHREND's Koppel, S. of the high-road to Süderhastedt, 150 M. from the place where the road divides. Altitude of the deposit + 18 M.

Poor, grey clay.

See: MADSEN, V. 1895. Istdens Foraminiferer i Danmark og Holsten. Medd. fra Dansk geol. Foren. Nr. 2, p. 80.

10. Burg i D. The clay-pit of ALSÉN (earlier of MUSFELDT) 1,5 km. NNE. of the old »Burg«. Alt. of the deposit + 6.

Blue-grey clay.

¹) 1898. Mitth. Geogr. Ges. in Hamburg. Bd. XIII, XIV.

²) The nos. of the localities are those of Dr. GOTTSCHÉ.

See: Istidens Foraminiferer p. 78,

and: MUNTHE, H. 1897. Studien über ältere Quartär-ablagerungen im südbaltischen Gebiete. Bull. geol. Inst. Upsala. Nr. 5. Vol. III, 1896, p. 94.

12. Seefeld. CL. WOHLERS' Koppel, S. of the highroad to Hanerau. Alt. of the deposit + 30.

Grey clay.

See: Istidens Foraminiferer p. 82; there this locality is called Beringstedt.

15. Nienbüttel. Two marl-pits 500 m. NE. and 625 m. ENE. of Rothensand. Alt. of the country + 35.

Poor, grey clay.

Miliolina seminulum L. 1 specimen. 0,35 mm.

Miliolina oblonga MTG. 5 spec. 0,42.

Miliolina subrotunda MTG. 5 spec. 0,44.

Polymorphina lactea W. & J. 2 spec. 0,29.

Polymorphina lanceolata Rss. 2 spec. 0,63.

Polymorphina compressa D'ORB. 1 spec. 0,37.

Pulvinulina punctulata D'ORB. Not rare. Small hyaline spec. 0,40.

Rotalia Beccarii L. Very common. The commonest species of the larger foraminifera. 0,77.

Nonionina depressula W. & J. Very common. The commonest species of the smaller foraminifera. 0,59.

Polystomella striatopunctata F. & M. Not common. 0,53.

Polystomella striatopunctata var. *incerta* WILL. Not common. 0,55.

Ostracods. Not rare.

18. Itzehoe. ALSEN's clay-pit at Ochsenkamp. Alt. of the deposit + 25.

Poor, grey clay.

See: Istidens Foraminiferer p. 111.

19. Rensing. ALSEN's (earlier FEWER's) clay-pit, 1,4 km. NE. of the railway station Kellinghusen. Alt. of the deposit + 5.

Lenticles of poor, grey clay in rich, reddish or dark clay.

See: Istidens Foraminiferer p. 110; there this locality is called Kellinghusen.

21. Glinde near Uetersen.

a. ALSSENS's clay-pit, 1,4 km. SE. of the cement-manufactory. Alt. of the country + 4.

»Cementthon«.

Bolivina costata D'ORB.? 1 badly preserved specimen, perhaps tertiary. 0,50.

Pulvinulina punctulata D'ORB. Not rare. Small hyaline specimens. 0,46.

Rotalia beccarii L. Rather common. 0,79.

Rotalia beccarii var. *lucida* MADSEN. A few spec. 0,33.

Nonionina depressula W. & J. Very common. The commonest species. 0,40.

Polystomella striatopunctata F. & M. Rather common. 0,52.

Polystomella striatopunctata var. *incerta* WILL. Rather rare. 0,50.

Ostracod. 1 spec.

22. Blankenese.

a. RÖTGER's clay-pit, 0,7 km. WSW. of the railway-station. Alt. of the deposit + 40.

Black clay below the oyster-bank.

Rotalia beccarii L. 5 spec. 0,75.

Nonionina depressula W. & J. Common. The commonest species. 0,44.

Polystomella striatopunctata F. & M. Not rare. 0,42.

Polystomella striatopunctata var. *incerta* WILL. 2 spec. 0,42.

c. Sandpit in Krähenberg, 0,8 km. W. of the railway-station. Alt. of the deposit + 62.

Oyster-bank.

See: *Istidens* Foraminiferer p. 72.

23. Döckenhuden, Villa Münchmeyer, 0,6 km. SE. of the Blankenese station. Alt. of the deposit ÷ 13,6.

Greenish grey clay-marl.

Rotalia beccarii L. Very common. The commonest species of the larger foraminifera.

Rotalia beccarii var. *lucida* MADSEN. A few spec.

Nonionina depressula W. & J. Very common. The commonest species of the smaller foraminifera.

Polystomella striatopunctata F. & M. Rather rare.

Polystomella striatopunctata var. *incerta* WILL. A few spec.
Ostracods.

24. Nienstedten, Elbschlossbrauerei, 1 km. SSW. of Flottbeck station. Alt. of the deposit \div 13,5.

Greenish grey clay-marl.

Rotalia beccarii L. Very common. The commonest species of the larger foraminifera.

Nonionina depressula W. & J. Very common. The commonest species of the smaller foraminifera.

Polystomella striatopunctata F. & M. 1 spec.

Ostracods.

28. Lauenburg.

c. BRAND & ANCKER'S clay-pit, 0,7 km. NNE. of the railway-station. Alt. of the deposit \div 35.

Sand.

See: Istidens Foraminiferer p. 74.

30. Hakemühlen, c. 5 km. SW. of the railway station Basbek.

Rather rich, grey marl.

Rotalia beccarii L. Very common. The commonest species of the larger foraminifera. 0,75.

Nonionina depressula W. & J. Very common. The commonest species of the smaller foraminifera. 0,59.

Polystomella striatopunctata F. & M. A few spec. 0,42.

Polystomella striatopunctata var. *incerta* WILL. A few spec. 0,57.

Ostracods. Common.

35. Hostrup Skov. Two clay-pits 1,8 and 2,2 km. E. of Laxmølle on the southern side of Aabenraa Fjord. Alt. of the deposit \div 13.

Cyprina-clay.

Nonionina depressula W. & J. Common. The great majority belonged to this species. 0,40.

Polystomella striatopunctata F. & M. 1 spec. 0,39.

Rotalia beccarii var. *lucida* MADSEN. A few spec. 0,29.
Ostracods.

36. Sönderskoven, 4,5 km. ESE. of Sönderborg.
Cyprina-clay.

See: MUNTHE's Studien p. 53.

37. Mommark. Exposure on the shore, 0,3 km. N.
of the ferry. Alt. of the deposit + 5.

Cyprina-clay.

Miliolina seminulum L. Rather rare. 1,19.

Polymorphina lactea W. & J. 4 spec. 0,37.

Rotalia beccarii var. *lucida* MADSEN. Not rare. 0,31.

Nonionina depressula W. & J. Very common. The
great majority belonged to this species. 0,37.

Polystomella striatopunctata var. *incerta* WILL. 4 spec.
0,74.

38. Kegenæs. Cliff below the lighthouse. Alt. of
the deposit + 4

α. »Ächter Cyprinenthon«.

Miliolina seminulum L. 2 spec. 0,52.

Polymorphina lactea W. & J. 3 oblong spec. 0,40.

Polymorphina sororia Rss. 1 spec. 0,64.

Polymorphina oblonga D'ORB. 8 spec. 0,74.

Rotalia beccarii var. *lucida* MADSEN. Rather common.
0,37.

Nonionina depressula W. & J. Very common. The
great majority belonged to this species. 0,39.

Polystomella striatopunctata var. *incerta* WILL. 5 spec.
0,39.

Polystomella arctica P. & J.? 1 spec. 0,46.

β. »Cyprinenthon, ? ob umgelagert«.

Miliolina seminulum L. Rather rare. 1,31.

Polymorphina lactea W. & J. Rather rare. 0,40.

Polymorphina oblonga D'ORB. Rather rare. 0,61.

Rotalia beccarii var. *lucida* MADSEN. Not rare. 0,40.

Nonionina depressula W. & J. Very common. The
great majority belonged to this species. 0,55.

Polystomella striatopunctata F. & M. 5 spec. 0,44.

Polystomella striatopunctata var. *incerta* WILL. Rather rare. 0,66.

Polystomella arctica P. & J. 3 spec. 0,59.

Ostracods.

39. Havernæs. Exposure on the coast E. of this place. Alt. of the deposit + 5.

Cyprina-clay.

Miliolina seminulum L. 5 spec. 0,55.

Polymorphina lactea W. & J. Not rare. 0,46.

Polymorphina oblonga D'ORB. 6 spec. 0,85.

Rotalia beccarii var. *lucida* MADSEN. Rather common. 0,37.

Nonionina depressula W. & J. The commonest species. 0,46.

Polystomella striatopunctata F. & M. 6 spec. 0,33.

Polystomella striatopunctata var. *incerta* WILL. Rather common. 0,52.

Ostracods.

40. Stöfs. Gravel-pit 1,2 km. SSE. of Meierhof. Alt. of the deposit + 40.

Oyster-bank.

Lagena laevigata Rss. 1 spec. 0,22.

Globigerina bulloides D'ORB. 2 spec. 0,26.

Rotalia beccarii L. Common. The commonest species. 0,70.

Nonionina depressula W. & J. Rather common, especially among the smaller specimens. 0,35.

Polystomella striatopunctata F. & M. Rather common. 0,52.

Polystomella striatopunctata var. *incerta* WILL. A few spec. 0,35.

41. Tarbeck, 3 km. ESE. of Bornhöved.

a. The oyster-bank of Grimmelsberg, 0,1 km. SE. of Δ 83. Alt. of the deposit + 79.

See: *Istidens Foraminiferer* p. 68,

and: MUNTHER'S *Studien* p. 88.

d. TENSFELD'S clay-pit, N. of the highway, 0,2 km. SW. of Δ 83. Alt. of the deposit + 69.

Poor, brownish or grey clay.

See: MUNTHE'S Studien p. 89.

e. BLUNCK'S (earlier JEDE'S) clay-pit S. of the highroad, 0,6 km. S. of Δ 83. Alt. of the deposit + 65.

Poor, grey clay.

See: Istidens Foraminiferer p. 69.

42. Fahrenkrug. Clay-pit 1,5 km. N. of the railway-station. Alt. of the deposit + 48.

Clay.

See: Istidens Foraminiferer p. 70.

Distribution Tables.

A. Arctic group.

<i>Foraminifera.</i>	18	19	De ældre Yoldia- lerlag, Denmark.
	Itzehoe.	Rensing.	
<i>Cassidulina crassa</i>	X	X	+
<i>Lagena globosa</i>	2	—	X
— <i>apiculata</i>	3	1	X
— <i>lævis</i>	1	—	1
— <i>sulcata</i>	2	1	X
— <i>semistriata</i>	1	—	X
— <i>squamosa</i>	9	7	X
— <i>lævigata</i>	X	X	+
<i>Polymorphina lactea</i>	X	X	+
— <i>sororia</i>	X	7	+
— <i>oblonga</i>	X	X	+
<i>Globigerina bulloides</i>	6	—	X
— <i>æquilateralis</i>	3	—	X
<i>Patellina corrugata</i>	—	1	X
<i>Rotalia beccarii</i> var. <i>lucida</i>	+	—	X
<i>Nonionina depressula</i>	+	+	+
— var. <i>orbicularis</i>	X	—	X
<i>Polystomella striatopunctata</i>	—	1	X
— var. <i>incerta</i>	+	+	+
<i>Polystomella arctica</i>	+	+	+

B. Boreal group.

<i>Foraminifera.</i>	7	10	12	15	30	Selbjerggaard, Denmark.
	Nindorf.	Burg.	Seefeld.	Nienbüttel.	Hakemühlen.	
<i>Miliolina seminulum</i>	6	—	—	1	—	—
— <i>oblonga</i>	—	—	—	5	—	—
— <i>pygmæa</i>	9	—	1	—	—	—
— <i>subrotunda</i>	—	—	—	5	—	—
<i>Verneuilina polystropha</i>	2	—	—	—	—	—
<i>Bulinina elegans</i>	1	—	—	—	—	—
<i>Nodosaria lævigata</i>	—	1	—	—	—	—
<i>Polymorphina lactea</i>	2	—	—	2	—	3
— <i>lanceolata</i>	1	—	—	2	—	—
— <i>compressa</i>	—	—	6	1	—	—
— <i>cf. oblonga</i>	—	—	1	—	—	—
<i>Globigerina bulloides</i>	5	—	—	—	—	—
— <i>cf. cretacea</i>	—	—	1	—	—	—
— <i>æquilateralis</i>	2	—	—	—	—	—
<i>Patellina corrugata</i>	1	—	—	—	—	—
<i>Truncatulina lobatula</i>	1	—	—	—	—	X
<i>Pulvinulina punctulata</i>	—	—	X	X	—	—
<i>Rotalia beccarii</i>	5	+	+	+	+	1
<i>Nonionina depressula</i>	+	X	+	+	+	+
— <i>var. orbicularis</i>	—	X	—	—	—	—
<i>Polystomella striatopunctata</i>	X	X	X	X	X	—
— <i>var. incerta</i>	X	4	X	X	X	—

C. Temperate group.

1. *Cyprina*-clay.

<i>Foraminifera.</i>	35	36	37	38	39	Danish <i>Cyprina</i> -clay.
	Hostrup Skov.	Sønderskov. (MUNTHE).	Mommark.	Kegenees.	Havernæs.	
<i>Miliolina seminulum</i>	—	+	×	×	5	+
— <i>bicornis</i>	—	×	—	—	—	×
— <i>boueana</i>	—	×	—	—	—	—
<i>Bulimina elegans</i>	—	×	—	—	—	—
— <i>pupoides</i>	—	×	—	—	—	—
— <i>buchiana</i>	—	×	—	—	—	—
— <i>marginata</i>	—	×	—	—	—	—
<i>Cassidulina crassa</i>	—	×	—	—	—	—
<i>Fronidularia cf. alata</i>	—	1	—	—	—	—
<i>Cristellaria gibba</i>	—	×	—	—	—	—
— <i>rotulata</i>	—	×	—	—	—	—
— <i>cf. crassa</i>	—	×	—	—	—	—
<i>Polymorphina lactea</i>	—	×	4	×	×	+
— <i>gibba</i>	—	×	—	—	—	—
— <i>sororia</i>	—	—	—	1	—	×
— <i>acuta</i>	—	×	—	—	—	—
— <i>compressa</i>	—	×	—	—	—	—
— <i>cf. problema</i>	—	×	—	—	—	×
— <i>oblonga</i>	—	×	—	×	6	+
— <i>rotundata</i>	—	×	—	—	—	—
<i>Globigerina bulloides</i>	—	X?	—	—	—	—
<i>Truncatulina lobatula</i>	—	×	—	—	—	—
— <i>ariminensis</i>	—	X?	—	—	—	—
<i>Rotalia beccarii</i>	—	+	—	—	—	+
— <i>var. lucida</i>	×	+	×	×	×	+
<i>Nonionina depressula</i>	+	+	+	+	+	+
— <i>pompilioides</i>	—	×	—	—	—	—
<i>Polystomella striatopunctata</i>	1	+	—	5	6	×
— <i>var. incerta</i>	—	—	4	4	×	×
— <i>subnodosa</i>	—	×	—	—	—	—
(— <i>arctica</i>)	—	—	—	4	—	—

C. Temperate group.
2. Oyster-banks of Holstein.

<i>Foraminifera.</i>	22	40	41	Danish <i>Cyprina</i> -clay.
	Blankenese.	Stöfs.	Tarbeck.	
<i>Lagena laevigata</i>	1	1	—	×
<i>Polymorphina compressa</i>	1	—	—	—
<i>Globigerina bulloides</i>	1	2	—	—
<i>Discorbina parisiensis</i>	×	—	—	—
<i>Rotalia beccarii</i>	+	+	+	+
<i>Nonionina depressula</i>	×	×	+	+
<i>Polystomella striatopunctata</i>	×	×	∞	+
— <i>var. incerta</i>	×	×	1	×

C. Temperate group.
3. Clay-deposits of Holstein.

<i>Foraminifera.</i>	21	22	41	42	Danish <i>Cyprina</i> -clay.
	Glinde.	Blankenese.	Tarbeck.	Fahrenkrug.	
<i>Bolivina costata?</i>	1	—	—	—	—
<i>Lagena globosa</i>	—	—	—	1	—
— <i>laevis</i>	—	—	—	1	—
<i>Globigerina bulloides</i>	—	—	—	5	—
<i>Pulvinulina punctulata</i>	×	—	—	—	—
<i>Rotalia beccarii</i>	×	5	—	+	+
— <i>var. lucida</i>	×	—	—	×	+
<i>Nonionina depressula</i>	+	+	+	+	+
<i>Polystomella striatopunctata</i>	×	×	×	×	+
— <i>var. incerta</i>	×	2	—	×	×

C. Temperate group.

4. Deposits of the first interglacial period.

<i>Foraminifera.</i>	23 Dockenhuden.	24 Nierstedten.	28 Lautenburg.
<i>Lagena lavigata</i>	—	—	2
<i>Rotalia beccarii</i>	+	+	+
— — <i>var. lucida</i>	×	—	—
<i>Nonionina depressula</i>	+	+	×
<i>Polystomella striatopunctata</i>	×	1	—
— — <i>var incerta</i>	×	—	1

In the tables the occurrence of a species is indicated by ×, a common or very common occurrence by +. The very rare occurrence of a species is denoted numerically, thus showing the actual number of specimens found.

The foraminifera fauna of the arctic group is almost the same as the fauna of the corresponding Danish deposits. Only one of the Holstein species has not yet been found in Denmark.

Only one boreal deposit is known with certainty in Denmark, viz. the *Leda pernula* clay at Selbjerggaard. There is no great similarity between the fauna of this deposit and the fauna of the Holstein deposits of this group, only 4 of 22 Holstein species are found at Selbjerggaard, the reason being perhaps the great distance between this locality and those of Holstein. Nevertheless, the characteristic southern species *Rotalia beccarii* occurs both in Holstein and in Denmark, the characteristic arctic species *Polystomella arctica* being absent in the deposits of both countries.

As to the deposits of the temperate group, there is a rather great similarity between the foraminifera fauna of the oyster-banks and clay-deposits of Holstein on the one hand

and the *Cyprina*-clay of Denmark on the other, the characteristic *Rotalia beccarii* occurring in all three deposits. The mollusc faunas are also similar.

A great and important difference exists between the *Cyprina*-clay of Slesvick and that of Denmark. *Rotalia beccarii* is very common in the Danish *Cyprina*-clay, but in all the specimens that I have examined of the *Cyprina*-clay from Hostrup Skov, Mommarmk, Kegenæs and Havernæs I never succeeded in finding this characteristic species. Nevertheless it is found by REUSS in *Cyprina*-clay from Dybbøl¹⁾ and occurs in most of the specimens from Sönderskoven examined by MUNTHE. A like dissimilarity exists between the mollusc faunas; the southern species *Ostrea edulis*, *Tapes aureus* and *Tapes pullastra* are never found in the *Cyprina*-clay of Slesvick, although they are not rare in the Danish *Cyprina*-clay. Yet there occur southern species in the *Cyprina*-clay of Slesvick, e. g. *Nassa reticulata*, *Cerithium reticulatum*, and *Scalaria communis*. It seems as if the *Cyprina*-clay of Slesvick was not deposited under quite the same conditions as the Danish *Cyprina*-clay.

The arctic foraminifer *Polystomella arctica*, four specimens of which have been found in the *Cyprina*-clay of Kegenæs, must here occur as a secondary deposit. It can not belong to the fauna of the *Cyprina*-clay.

Deposits corresponding to those of Dockenhuden, Nienstedten, and Lauenburg have not yet been found in Denmark.

¹⁾ 1855. Sitzungsbericht d. Wiener Akad. Math.-Naturw.-Classe. B. XVIII, p. 209, T. 5, Fig. 57.